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The Peach Tree Borer
and Its Control

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SUMMARY

Paradichlorobenzene properly used has given 90 to 100% control of the peach tree borer in Pennsylvania.

The Age of Trees To Treat. P D B may be safely used on trees three years old or older.

Dose. For trees from three to six years use one-half ounce; trees six years and older use three-fourths ounce.

Time to Apply. Fall is the best time to make the treatment, the time varying from September 1st to 15th for the northern part and from September 15th to October 10th for southern part.

Steps in Successful Treatment:

1. Remove grass and weeds from ground at base of tree.
2. Pile up ground about tree to height of highest borer entrance. Make firm, and level for a distance of one foot around base of tree.
3. Place P D B in a narrow band around tree about one to two inches away from the tree, never against the bark.
4. Cover the P D B by banking up the earth (stones removed), about 5 inches, Use 10 to 12 shovelfuls. Make firm by beating down with back of shovel.
5. After three weeks remove mound of earth. In all cases mounds should be removed before the middle of June of the following year. This is to prevent the female moth from placing eggs high on the trunk, which would make subsequent P D B treatments difficult.

PEACH TREE BORER AND ITS CONTROL

By T. L. Guyton and J. R. Stear, Bureau of
Plant Industry

INTRODUCTION

The peach tree borer (*Aegeria exitiosa* Say) in past years was one of the difficult insects for the orchard grower to control. The recent development of the paradichlorobenzene (P D B) treatment has made the control a rather simple matter.

This bulletin is a summary of the information on the subject thus far developed by the Federal Bureau of Entomology and the State Experiment Stations together with the results obtained in Pennsylvania from 1921 to 1925 by the Bureau of Plant Industry, Pennsylvania Department of Agriculture in Franklin and Erie Counties. This work covered in particular the optimum time of treatment for northern and southern Pennsylvania, length of treatment for effective kill, amount of material to use and age at which trees can be safely treated.

THE PEACH TREE BORER

The borer is a white or light yellow worm with a dark brown head. It reaches a length of about one inch when fully grown. After reaching maturity the larva forms an elongate brown cell of wood particles within which it changes into the winged adult. The adults are wasplike in appearance. They are dark shining blue in color. The female is more robust than the male and has a broad orange colored band on the abdomen. The male is slender bodied and usually has several narrow yellow bands on the abdomen.

Life History.¹ The earliest adult emerges about the middle of June in southern Pennsylvania and two weeks later in northern Pennsylvania. From this time until September 15th adults continue to emerge though few appear after September 1st. They live for only a few days after emerging, but during this time the female lays several hundred eggs. The eggs hatch in nine to ten days, and shortly afterwards the young larvae burrow into the bark. The greater portion of the time of the life cycle of the borer occurs in burrows under the bark of the tree, the larva feeding until winter, remaining quiet over winter and feeding in the spring until pupation occurs in late spring or summer.

¹Notes on the life history in southern Pennsylvania were made by Mr. E. M. Craighead, formerly with the Pennsylvania Department of Agriculture.

Injury. The peach tree borer injures the peach tree by burrowing into and under the bark at the base of the tree, usually below the surface of the ground. The presence of borers in the tree is indicated by the exudation of masses of gum mixed with sawdust-like castings. In many cases trees are so badly attacked by borers that they are girdled and killed.

P D B CONTROL OF THE BORER¹

History of Development. P D B is a recent development in peach tree borer control. The first experiments with the material as an insecticide against the peach tree borer were started in 1916 by the Federal Bureau of Entomology. The results of these experiments were published in 1919 as Bulletin 796 of the United States Department of Agriculture. In this Bulletin it is recommended that P D B be used at the rate of one ounce per tree on trees six years old or older. On trees of this age the percent of control is given at approximately 94. Since this publication further experimentation has been done at State Experiment Stations particularly along the lines of amount of material necessary for effective kill, length of time of exposure necessary and safe and effective treatments for trees under 6 years of age.

What is P D B? P D B is a white chrySTALLINE solid, insoluble in water and somewhat like coarse Epsom salts in appearance. At temperatures above 60° Fahr. it changes into a gas which is heavier than air. This gas under ordinary conditions is not injurious to man. It is slowly poisonous to insects.

Method of Application. Before applying P D B a space about a foot wide all around the tree should be cleared of grass, stones, debris, etc., using care to disturb the soil as little as possible. A long handled, round pointed shovel is a very good tool for this work. Fill in with ground to the height of the highest borer injury. P D B is heavier than air, and borers working above the level of application may not be killed. After clearing the ground at the base of the tree and leveling it up where necessary, place the charge of P D B in an even band one to two inches from the tree. Do not place the material against the bark. Cover over with ten or twelve shovelfuls of earth, mounding up the tree five or six inches high.

The first shovel of earth should be finely divided and should be carefully placed over the P. D. B. After forming the mound pack firmly by striking with the back of the shovel. In no case should

¹Throughout this bulletin the authors have used the abbreviation P D B in place of the cumbersome term "paradichlorobenzene," and they propose for the sake of brevity and ease of pronunciation that P D B be generally adopted.

clods or large stones be used in making the mound as they may allow the gas to escape too rapidly.

In applying P D B a crew of three men can work to good advantage—one going ahead and preparing the tree, one carrying and applying the material, and one following and covering the material.



PLATE I. Stages in the application of P D B. (1) Tree before treatment. (2) Ground elevated to highest borer hole. (3) P D B in place about the tree. (4) Mound of earth over P D B.

Three men can treat from 50 to 60 trees per hour in this way at a cost of about three cents per tree for material and labor.

Length of exposure. Two weeks exposure is sufficient to kill the larvae in the base of the tree, but for larvae which have pene-

trated down into the roots, three weeks are more effective. Some growers leave the material in place over winter without apparent injury, but this practice is not advised. To avoid possible injury, especially on three and four year old trees, the P D B should not be left in place longer than three weeks.

Two weeks exposure gave excellent results in the orchard of A. J. Hafer at Chambersburg, Pa. In this orchard, sixty trees were treated at the rate of ten each week over a period of six weeks. The first ten were treated on September 11th and the last ten on October 16th. On half of the trees the material was left on for two weeks and on the other half for three weeks. On checking up the results it was found that the trees treated on September 11th, 18th and 25th for two and three weeks contained no living borers. Of the trees treated October 3rd, two weeks exposure gave 92.5% control, three weeks gave 100% control. Of the trees treated October 9th, two weeks exposure gave 100% control, three weeks gave 97.5% control. Of the trees treated October 16th, two weeks gave 97.5% control, three weeks gave 95%. (See Table I.)

The P D B may be removed by tearing away the mound to the ground level. If it is desired to mound the trees over winter, the base of the tree can then be left open for a few days to allow all the P D B to escape after which the tree can be mounded with fresh earth.

TABLE I.—Result obtained by early and late Fall treatments for two and three weeks.

No. of Trees	Date of Treatment	Exposure	No. of Living Borers	% Control
5	Sept. 11th	14 days	0	100
5	" 11th	21 days	0	100
5	" 18th	14 days	0	100
5	" 18th	21 days	0	100
5	" 25th	14 days	0	100
5	" 25th	21 days	0	100
5	Oct. 3rd	14 days	3	92.5
5	Oct. 3rd	21 days	0	100
5	Oct. 9th	14 days	0	100
5	Oct. 9th	21 days	1	97.5
5	Oct. 16th	14 days	1	97.5
5	Oct. 16th	21 days	2	95
5	Checks		41	0

Time of application. Late summer and early fall are the best times to use P D B in controlling peach tree borers. It will be noticed in the short description of the life cycle of the peach tree borer that for the most part the moths have finished egg laying about September 1st. From observation made in Erie County it was determined that the egg-laying period is over by the last week of August. Treatments started September 1st and continued until October 1st, gave practically 100% kill. Not only were these treatments successful in plots under the direct care of the Bureau

of Plant Industry, but were equally successful in the hands of the growers.

From observations made in Franklin County it was determined that the egg laying of the peach borer is practically over by September 10th. Treatments started one week later were as successful as those in Erie County. From the data gathered in these two counties, and from observations made in other peach growing sections, it seems that beginning in the northern counties treatment should be placed during the first three weeks of September, and that the desirable time comes later farther south in the state, for the southern tier of counties the date being for a period of three weeks beginning September 15th.

If for any reason fall treatment has not been made and the grower does not care to worm the trees by hand, a spring application may be made. This treatment should be in place as soon as the ground warms up in the spring. From soil temperatures taken in the southern half of the state, May 10th was found to be the right time to begin spring treatment. Applications made in two Franklin County orchards on May 10th, and examined on May 26th, gave 84% control.

From like records taken in the northern part of the state, June 1st was found to be the time to begin. Applications made June 2nd in Erie County, and checked June 23rd, gave 93% kill.

When a spring treatment is made it should always be followed by a fall treatment to catch the summer infestation of borers, after which yearly fall treatments should be made.

Age of Trees. The use of P D B in recommended doses is safe on trees three years old and older. Its use on trees before the fall of the third growing season is attended with some danger of injury, and is not advised at present, though it is questionable if worm and "worming" injury may not be more serious than that of P D B.

Peach trees planted in the spring in an orchard of Mr. Clayton Miller, Marion, Pa., were treated that fall with one fourth ounce of P D B and the three following falls with one-half ounce. Each year the mounds were removed after fourteen days. Spotting of the bark occurred in a band about two inches wide at the base of the trees (see Plate II). These spots were dead brown areas about one-fourth inch in diameter. For the most part they were superficial and did not extend into the cambium, (the growing bark). at the end of four years the trees were quite vigorous in top growth and were entirely free from borer injury.

Amount to Use. The amount of P D B necessary to treat a tree varies with the size of the tree. One-half ounce is sufficient on a

tree three to six years old. On older and larger trees it may require three-fourths to one ounce. In weighing the amount of material, avoirdupois scales should be used. Postal scales are satisfactory. After weighing the desired amount secure a small vessel which will just hold the weighed dose, and use this vessel in measuring subsequent doses in the field. Some manufacturers of P D B provide an ounce measure with each container of material. Where scales or measures are not available it will be found that a tablespoon slightly more than level full will hold about one-half



PLATE II. Bark injury from P D B treatment on young peach trees:

Fig. 1. 3 yr. old tree untreated.

Fig. 2. 3 yr. old tree treated the second year after planting.

Fig. 3. 3 yr. old tree treated the first and second year after planting.

Photographed by H. B. Kirk

ounce. To determine the amount accurately without scales the authors have used the following method. Cut a piece of heavy paper or cardboard to the size shown in Fig. I.

To measure one ounce use a cylinder formed by rolling the edge of sheet marked EF over until it rests on the line CD. The margin of the sheet between C D and A B is used as an overlap to close the cylinder, and may be fastened with paste or pinned together. To make a cylinder holding one-half or three-fourths ounce, cut

the sheets at indicated lines. In measuring set cylinder on a smooth surface and fill level full.

P D B may be purchased from

Hooker Electro-Chemical Co., 25 Pine St., New York, N. Y. (Shipments made from Eschota, N. Y. and New York.) and from

E. C. Klipstein & Sons Co., 644 Greenwich St., New York. (Shipments made from South Charleston, W. Va.) It may also be secured from many local dealers in spray materials.

WARNING

P D B cannot be used with safety on apple trees of any age.

BUY ONLY THE PURE CRYSTALS, since compounds are diluted with materials which are worthless, or may even prove harmful to the trees.

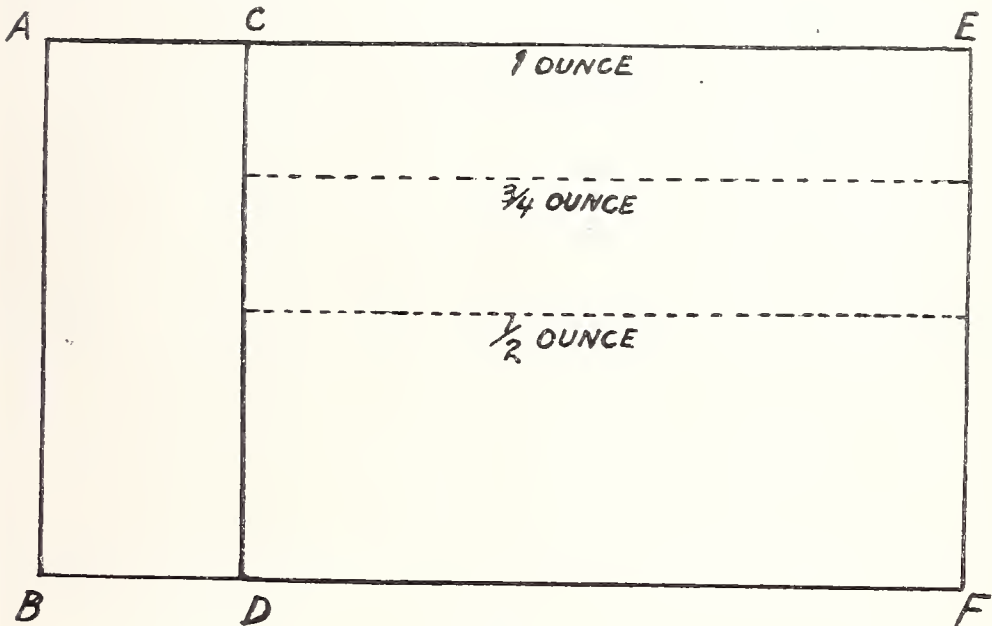


Fig. I

CONTROLS OTHER THAN P D B

For many years the most satisfactory method of control for peach borers was that of "worming" or cutting out of the grub by aid of a sharp knife. To be entirely successful the work should be done twice each year—in the late fall and again in the spring; and the workman must be very careful for it is an easy matter to overlook the smaller grubs. The work is very tiresome, and unless the laborer has a decided interest in the work there is a tendency to slight it. This method of control should be employed in caring for trees younger than three years. In doing the "worming" the soil is removed for a depth of five inches from about the base of the

tree and the opening left for one week. In this time the worms have made their presence known by the exudation of fine saw-dust like castings. With the aid of a sharp knife cut through the bark, and remove the borer. In making the cut remove no more of the bark than is necessary to expose the borer. Make the cuts the long way of the tree trunk. After worming mound the soil up about the base of the tree for five or six inches.

Washes of countless numbers have been tried as remedies for peach tree borers, none of which are to be relied upon for control.

Cultural Practices in Relation to Borer Control. As has just been stated, when borers are controlled by worming, the trees should be mounded after the worming operation, and the mound should be maintained through the summer. This is to force the entrance of the borers higher in the trunk, to facilitate the worming operation, and to keep the borers from gaining entrance into the large roots.

This practice is to be recommended as long as worming is done by hand, but with the older trees, which are to be given the P D B treatment, summer mounding should not be practiced because of the added expense involved in making a higher mound at the time of treatment, and a decided loss in the efficiency of the control. Mounds which are placed about older trees for winter protection should be leveled before the middle of June, and the ground should be kept level through the summer. When spring applications of P D B are made, it is desirable to level the mound three or four weeks after time of application.

PENNSYLVANIA DEPARTMENT OF AGRICULTURE

Organization and Services

FRANK P. WILLITS, *Secretary*

JOHN M. McKEE, *Deputy Secretary*

This Department is essentially a service agency created by legislative enactment to deal with administrative, regulatory, investigational, and educational problems which can best be solved through public rather than individual action. The organization provides for coordination and cooperation with the Pennsylvania State College and the U. S. Department of Agriculture. The Department operates through the following bureaus:

ANIMAL INDUSTRY:

T. E. MUNCE, *Director and State Veterinarian.*

Prevents and Eradicates transmissible diseases of animals and poultry, including tuberculosis of animals in cooperation with Federal Government.

Demonstrates to veterinarians control methods for transmissible animal diseases;

Supervises vaccination for and the prevention of hog cholera, anthrax, black leg and hemorrhagic septicemia;

Protects public from unwholesome meats through ante and post mortem examinations of animals at slaughtering establishments;

Inspects, licenses and furnishes information as to breeding, soundness and conformation of stallions and jacks standing for public service;

Enforces law requiring licensing of dogs and providing for protection of livestock and people from attacks of uncontrolled dogs;

Maintains laboratory for diagnostic research and experimental projects.

PLANT INDUSTRY:

C. H. HADLEY, *Director.*

Tests agricultural seeds for purity and germination, and enforces State Seed Law;

Inspects orchards, parks, farms, and plant imports for injurious insects and plant diseases;

Inspects and licenses Pennsylvania nurseries, and licenses all dealers in nursery stock;

Enforces laws governing apicultural practices, disease control and housing;

Places and enforces quarantines and carries on eradication campaigns against insect pests and plant diseases;

Inspects and certifies potatoes for seed purposes;

Makes investigations for the control of injurious insects and plant diseases including field tests of insecticides, fungicides and weed killers;

Maintains collections of insects, plant diseases, plants, and seeds, and identifies specimens.

FOODS AND CHEMISTRY:

JAMES W. KELLOGG, *Director—Chief Chemist*

Accomplishes its purpose of protecting Pennsylvania homes against harmful foodstuffs by sampling, analyzing, and bringing prosecution under the laws relating to foods and non-alcoholic drinks, including milk, cream, butter, ice-cream, eggs, sausage, fresh meats, soft drinks, fruit syrups, vinegar and kindred food products;

Regulates and issues licenses for the manufacture and sale of oleomargarine;

Licenses and regulates egg-opening plants and cold storage warehouses, maintaining regular inspection and enforcing twelve-month storage limit;

Inspects milk plants and creameries and regulates weighing, testing, buying and selling of milk and cream on a butterfat basis;

Protects honest manufacturers, importers, selling agents and ultimate users of feeding stuffs, fertilizers, lime products, linseed oil, paint, putty, turpentine, insecticides and fungicides, by means of annual registrations followed by inspections, analyses, prosecutions and the publication of the analyses of these products;

Analyses special samples for residents of the State at the rate of \$1.00 a sample for feeding stuffs, lime products and linseed oils.

MARKETS:

P. R. TAYLOR, *Director*

Investigates and assists in the marketing of farm products; at present chiefly grain and hay, fruits and vegetables, poultry and eggs, and tobacco;

Compiles and distributes daily market information as to supplies, shipments and prices;

Advises growers on transportation of agricultural products;

Assists cooperative associations and public markets;

Establishes standard grades of farm products and maintains inspection.

STATISTICS:

L. H. WIBLE, *Director.*

Assembles and disseminates essential statistics and facts pertaining to the agriculture of the State, from monthly reports rendered by hundreds of volunteer crop correspondents, information which assists the producer in his sales and interests all industries which deal with agricultural products;

Cooperates with U. S. Bureau of Agricultural Economics in joint crop and livestock reporting and publishes annual and monthly summaries of the data;

Compiles dates of county and local fairs and assembles data pertaining to their success and results during each year.

